

aiutare

a modular benchmarking framework

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aiutare: “to help”
(I you tar eh)

case study example:

SMT solution cross-checking

SMT problem

String x

String y

String m

String n

$y + x = n + m$

$n = ""$

$\text{len}(x) = \text{int}(m)$

SATISFIABLE or **UNSATISFIABLE?**

SMT solver → solution

String x = ""

String y = "0"

String m = "0"

String n = ""

$y + x = n + m$

$n = ""$

$\text{len}(x) = \text{int}(m)$

SATISFIABLE or UNSATISFIABLE?

uses of SMT solvers?

SPARK2014



SMT solvers



solution

String x = ""

String y = "0"

String m = "0"

String n = ""

What if our
solution is
incorrect?

solution

```
String x = ""  
String y = ""  
String m = ""  
String n = ""
```

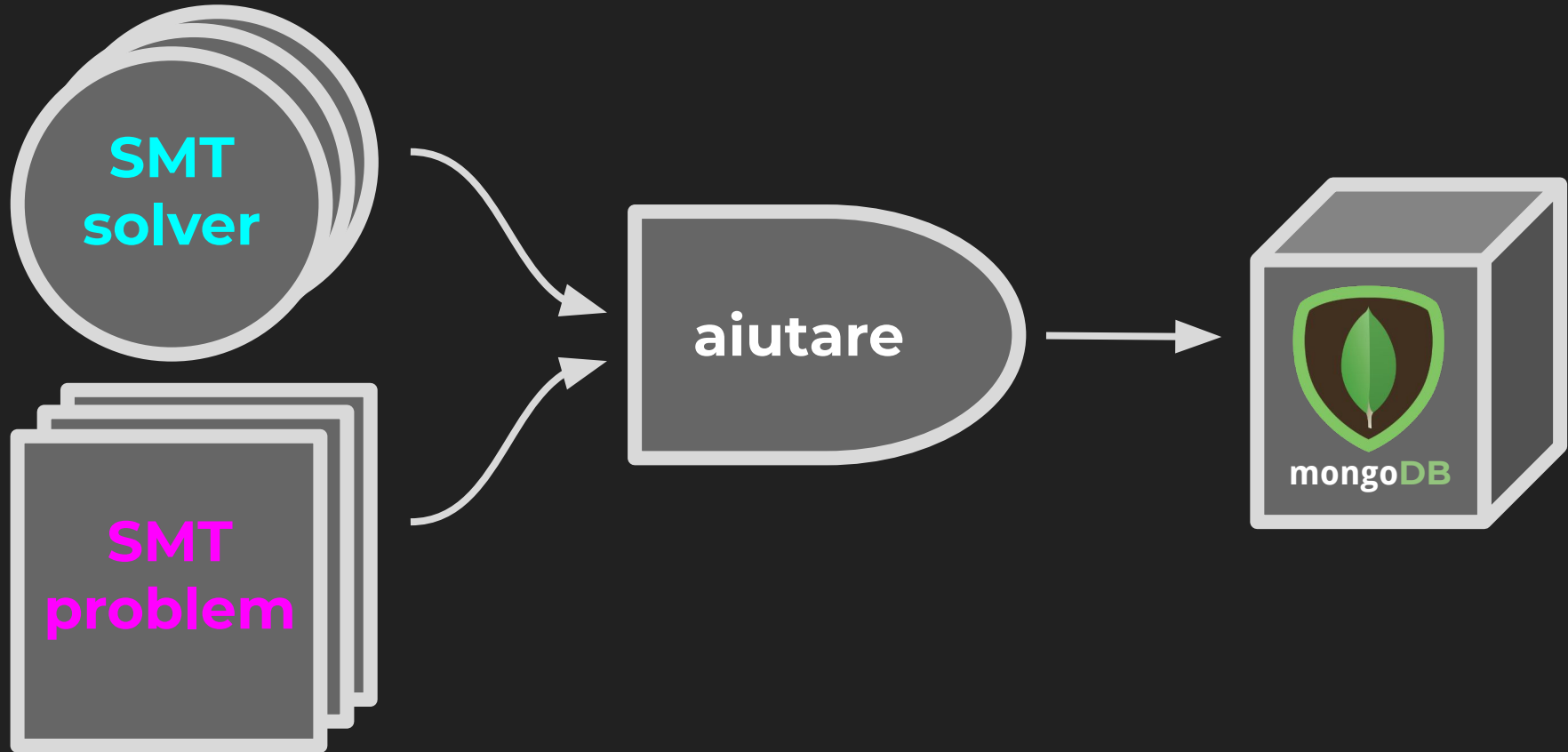
```
len(x) = int(m)
```

GOAL:
find **incorrect**
solutions

aiutare

helps make this easy!

usage for SMT solvers



experimental setup

- 4 SMT solvers
 - **z3_seq**
 - **z3_str3**
 - **z3_federico**
 - **cvc4**
- 18,000 problems

**SMT
problem**



String x
String y
String m
String n
 $y + x = n + m$
 $n = ""$
 $\text{len}(x) = \text{int}(m)$

SMT
problem
+
solution



String x = ""

String y = "0"

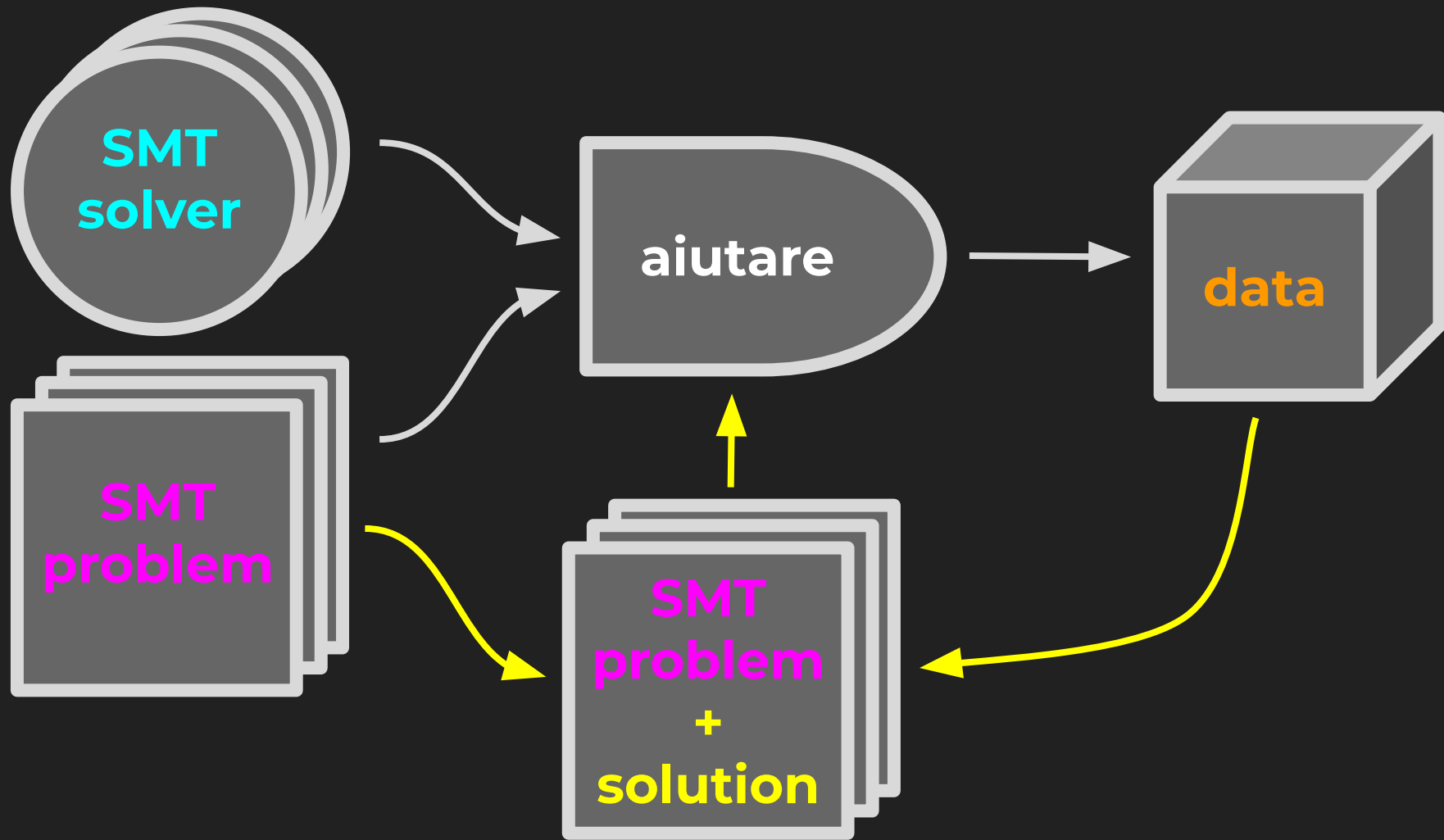
String m = "0"

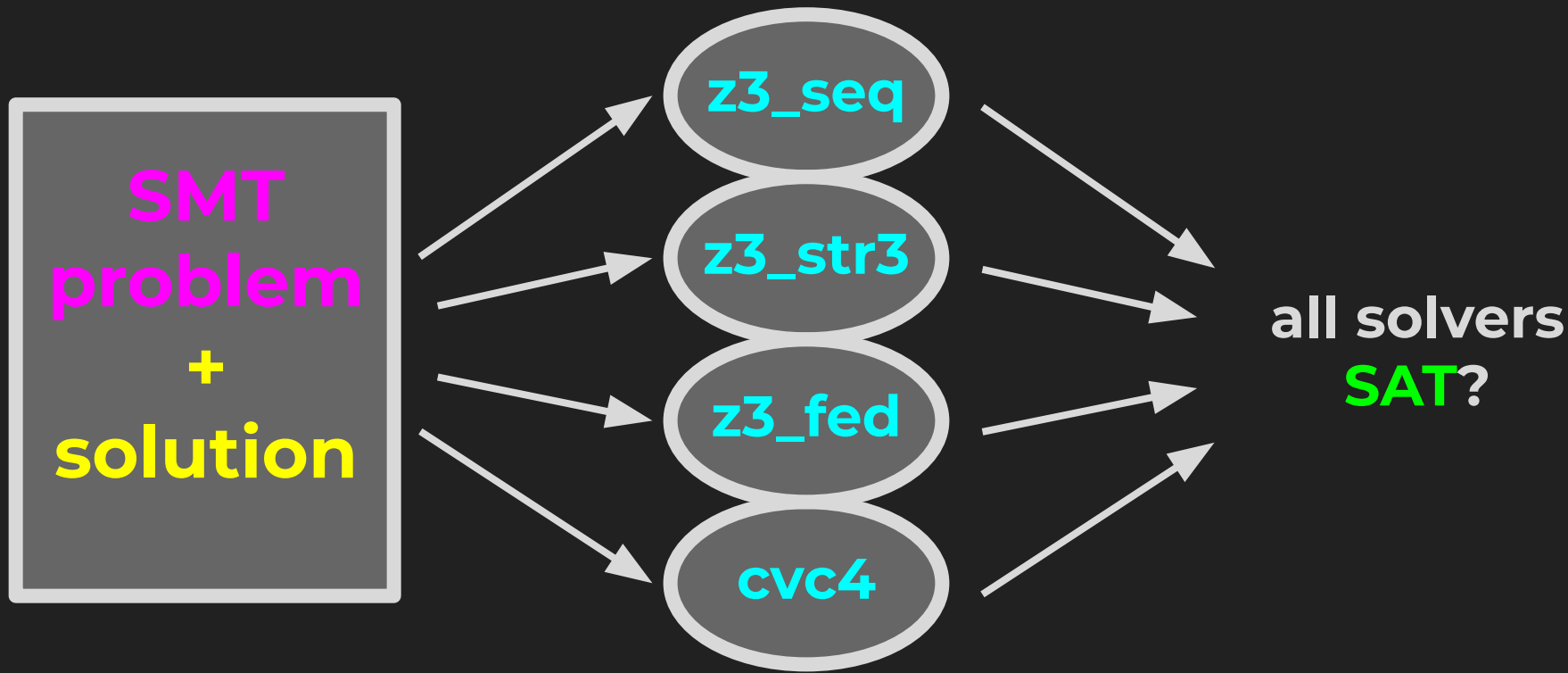
String n = ""

y + x = n + m

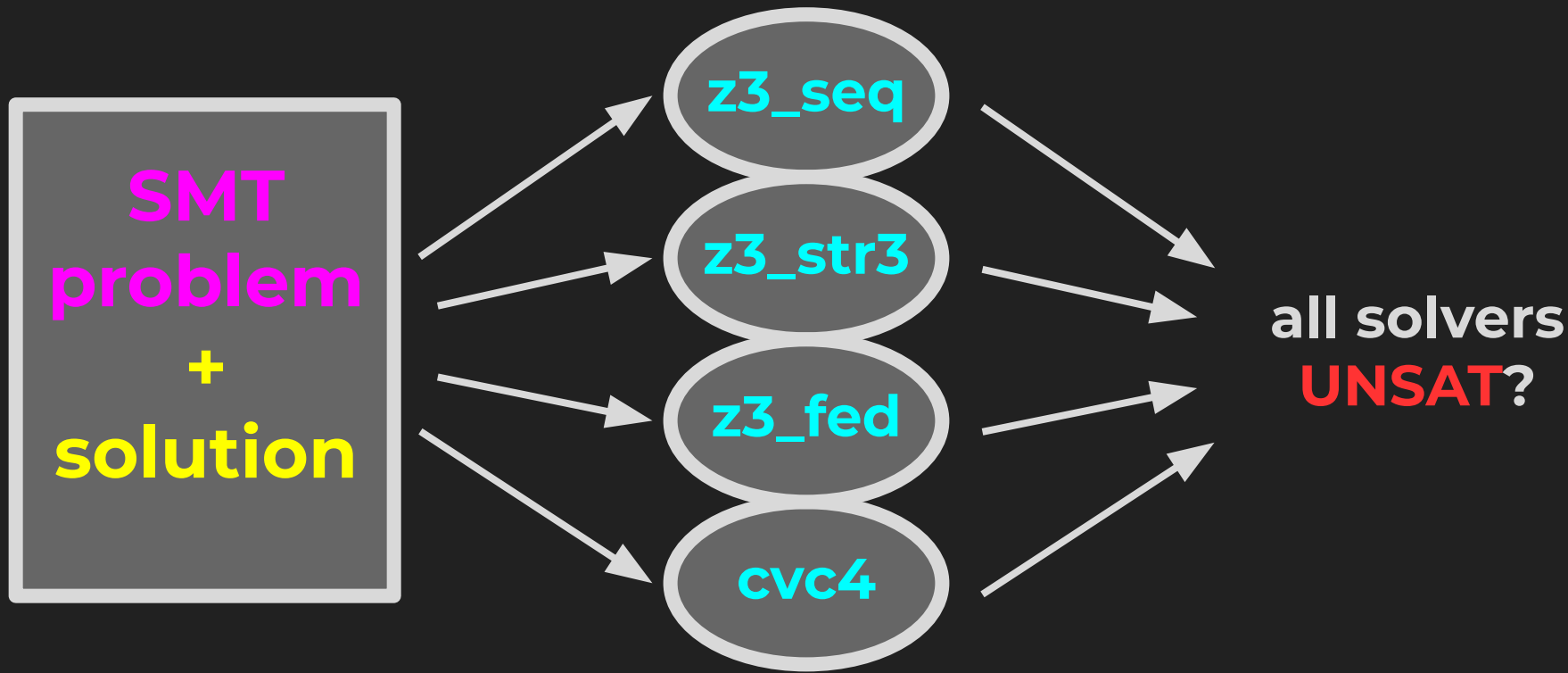
n = ""

len(x) = int(m)





**SOLUTION SUPPORTED
PROBLEM ASSUMED SAT**



SOLUTION UNSUPPORTED

what did this solver
answer for problem **P**?

UNSAT

SAT; solution **S** produced

for every solution **S** to
problem **P**, what did all
solvers answer for (**P** + **S**)?

what did all solvers answer
for problem (**P** + **S**)?

UNSAT

SAT

UNSAT

SAT



solver: z3

String x = ""

String y = ""

String m = ""

String n = ""

$y + x = n + m$

n = ""

$\text{len}(x) = \text{int}(m)$

solver: cvc4

String x = ""

String y = "0"

String m = "0"

String n = ""

$y + x = n + m$

n = ""

$\text{len}(x) = \text{int}(m)$

solver: z3

String x = ""

String y = ""

String m = ""

String n = ""

$y + x = n + m$

$n = ""$

$\text{len}(x) = \text{int}(m)$

4/4 UNSAT

solver: cvc4

String x = ""

String y = "0"

String m = "0"

String n = ""

$y + x = n + m$

$n = ""$

$\text{len}(x) = \text{int}(m)$

4/4 SAT

results

- 5 unsupported solutions
 - 2 from **cvc4**
 - 3 from **z3_seq**
- 4 unsupported “UNSAT”s from **z3_seq**

future work

- **performance analysis**
- **solution cross-checking for SAT solvers**

thank you!

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